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EXAMINER	
SHARON, AYAL I	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

3

Office Action Summary	Application No. 09/708,470	Applicant(s) SATO ET AL.	
	Examiner Ayal I Sharon	Art Unit 2123	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Introduction

1. Claims 1-36 of U.S. Application 09/708,470 filed on 11/09/2000, (and with a PCT priority date of 04/20/1999, and with a priority date of 05/14/1998 for Japanese Patent 10-132196), are presented for examination. Claims 1 and 19 were amended in paper #7.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

   (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The prior art used for these rejections is as follows:
4. Purks, U.S. Patent 5,481,695. (Henceforth referred to as "**Purks**").
5. Carlson et al., U.S. Patent 6,128,769. (Henceforth referred to as "**Carlson**").
6. Rhodes, D.L. "Parallel Computation for Microwave Circuit Simulation". <u>IEEE Transactions on Microwave Theory and Techniques.</u> Vol.45, Issue 5. May '97. pp.587-592. (Henceforth referred to as "**Rhodes**").
7. Huang, U.S. Patent 5,568,395. (Henceforth referred to as "**Huang**").

8. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

9. **Claims 1-6, 13, 19-24, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Purks in view of Carlson.**

10. **Claims 7-8 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Purks in view of Carlson and further in view of Official Notice, and further in view of Rhodes.**

11. **Claims 9-12, 14, 27-30, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Purks in view of Carlson and further in view of Huang.**

12. In regards to Claim 1, Purks teaches the following limitations:

1. A noise checking method used upon circuit designing for checking noise which has an influence on a signal waveform which propagates in a noticed wiring line on a design object circuit, ~~characterized in that it comprises~~ comprising the steps of:
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

producing a simulation model of a circuit portion relating to the noticed wiring line;
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

However, Purks only expressly teaches cross-talk noise, and not other types of noise as claimed in the following limitations.

Carlson, on the other hand, does expressly teach the use of switching noise as well as cross-talk noise.

performing a simulation using the simulation model to calculate a signal waveform which propagates in the noticed wiring line and calculate a noise waveform superposed on the signal waveform in the noticed wiring line for ~~each kind~~ a plurality of kinds of noise;

(Carlson, especially: col.3, lines 1-40; and col.4, lines 18-40)

synthesizing the signal waveform and the noise waveforms calculated for ~~individual~~ each of the plurality of kinds of noise with generation timings of the noise waveforms taken into consideration to obtain a noise composite waveform which is the signal waveform on which the noise is superposed; and
(Carlson, especially: col.3, line 52 to col.5, line 34;)

performing noise checking based on the noise composite waveform.
(Carlson, especially: Eq.1 in col.4; col.4, lines 18-40)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

13. In regards to Claim 2, Purks teaches the following limitations:

2. The noise checking method as set forth in claim 1, characterized in that, where an adjacent wiring line to the noticed wiring line is turned back in such a manner as to have a plurality of proximate portions which can electrically interfere with the noticed wiring line,
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

simulation models are produced with regard to the individual proximate portions of the adjacent wiring line and the noticed wiring line and the noise waveforms are calculated using the simulation models,
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

and then the noise waveforms calculated with regard to all of the proximate portions and the signal waveform are synthesized with generation timings of the noise waveforms taken into consideration.

(Purks, especially: col.2, “Summary of the Invention”; col.3, lines 13-49; Fig.4, Items 400-414))

14. In regards to Claim 3, Purks does not expressly teach the following limitations.

However, Carlson does expressly teach the following limitations:

3. The noise checking method as set forth in claim 1, characterized in that, when the noise checking is performed,
(Carlson, especially: col.3, line 41 – col.5, line 17)

a maximum delay time and a minimum delay time of the noticed wiring line are extracted from the noise composite waveform,
(Carlson, especially: col.3, line 41 – col.5, line 17)

and
overdelay/racing checking for the noticed wiring line is performed using the maximum delay time and the minimum delay time.
(Carlson, especially: col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order “to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits” (Carlson: col.3, lines 3-8).

15. In regards to Claim 4, Purks does not expressly teach the following limitations.

However, Carlson does expressly teach the following limitations:

4. The noise checking method as set forth in claim 1, characterized in that, where the signal waveform which propagates in the noticed wiring line is a clock waveform,
(Carlson, especially: col.3, line 41 – col.5, line 17)

when the noise checking

> is performed, a pulse period of the noise composite waveform is calculated from crossing points of the noise composite waveform and a high level discrimination threshold value/low level discrimination threshold value for the signal waveform,

(Carlson, especially: Fig.4, Fig.5 and col.4, line 18 – col.4, line 40)

> and pulse period checking of the clock waveforrn in the noticed wiring line is performed based on the pulse period.

(Carlson, especially: Fig.5 and col.5, lines 35-57)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

16. In regards to Claim 5, Purks does not expressly teach the following limitations. However, Carlson does expressly teach the following limitations:

> 5. The noise checking method as set forth in claim 1, characterized in that, where the signal waveform which propagates in the noticed wiring line is a clock waveform, when the noise checking is performed, a rising width and a falling width of the noise composite waveform are calculated from crossing points of the noise composite waveform and a high level discrimination threshold value/low level discrimination threshold value for the signal waveform, and pulse width checking of the clock waveform in the noticed wiring line is performed based on the rising width and the falling width.

(Carlson, especially: Fig.4, Fig.5 and col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing

problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

17. In regards to Claim 6, Purks does not expressly teach the following limitations. However, Carlson does expressly teach the following limitations:

6. The noise checking method as set forth in claim 1, characterized in that, where the signal waveform which propagates in the noticed wiring line is a clock waveform, when the noise checking is performed, a time required for the noise composite waveform to rise and another time required for the noise composite waveform to fall are calculated from crossing points of the noise composite waveform and a high level discrimination threshold value/low level discrimination threshold value for the signal waveform, and checking of the rising time/falling time of the clock waveform in the noticed wiring line is performed based on the times.

(Carlson, especially: Fig.4, Fig.5 and col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

18. In regards to Claim 7, Purks expressly teaches the use of UNIX-based stations on a network (see Purks, especially: Fig.3, Item 304; col.3, lines 36-41;). Official Notice is given that is well known in the art that the multi-threading and multi-tasking functions of UNIX operating system enable the creation of software

applications that can take advantage of the parallel processing capabilities of multi-processor machines such as Sun Microsystems™ workstations.

However, Purks does not expressly teach the following limitations:

7. The noise checking method as set forth in claim 1, characterized in that, when the simulation is performed, the simulation model is divided into a plurality of files, and simulations with regard to the plurality of files are executed individually by a plurality of processing sections of a parallel processor which operate parallelly, whereafter simulation result files by said plurality of processing sections are combined.

Rhodes does expressly teach the dividing of a simulation model into a plurality of files and running the files parallely on a parallel processor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with the teachings of Rhodes because "Typical MPC's [Massively Parallel Computers] allow for tens to several hundred or even thousands of nodes, and thus in principle offer the ability to apply a large amount of computational power and memory to a problem." (Rhodes, p.587, col.1, lines 4-7)

19. In regards to Claim 8, Purks expressly teaches the use of UNIX-based stations on a network (see Purks, especially: Fig.3, Item 304; col.3, lines 36-41;). Official Notice is given that is well known in the art that the multi-threading and multi-tasking functions of UNIX operating system enable the creation of software applications that can take advantage of the parallel processing capabilities of multi-processor machines such as Sun Microsystems™ workstations.

However, Purks does not expressly teach the following limitations:

> 8. The noise checking method as set forth in claim 1, characterized in that, when the simulation is performed, the simulation model is divided into a plurality of files, and simulations with regard to the plurality of files are executed individually by a plurality of processing sections interconnected over a network, whereafter simulation result files by said plurality of processing sections are combined.

Rhodes does expressly teach the dividing of a simulation model into a plurality of files and running the files parallely on a parallel processor. Moreover, Rhodes expressly teaches an implementation called "message passing" (p.588 and Fig.1(b) and Fig.1(c)), where processing nodes communicate with one another. This communication must inherently be on some sort of network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with the teachings of Rhodes because "Typical MPC's [Massively Parallel Computers] allow for tens to several hundred or even thousands of nodes, and thus in principle offer the ability to apply a large amount of computational power and memory to a problem." (Rhodes, p.587, col.1, lines 4-7)

20. In regards to Claim 9, Purks teaches the display of routing information:

> 9. The noise checking method as set forth in claim 1, characterized in that it further comprises the steps of:
>
> performing a noise analysis with regard to the noise composite waveform;
> (Purks, especially: Fig.4, Items 400, 410, 414 and 416)

Also, Purks teaches the use of a user interface, and more specifically, "a keyboard and/or mouse", both of which can be used to move a cursor ("pointing device") on the screen.

calculating, if the questionable wiring line displayed on said display section is moved on said display section by means of a pointing device, an actual movement amount of the questionable wiring line corresponding to an amount of the movement by said pointing device;
(Purks, especially: Fig.3, Item 300 and col.3, lines 12-25)

performing, in the state wherein the questionable wiring line is moved by the actual movement amount, the production of the simulation model, the simulation, the synthesis of the noise composite waveform and the noise checking again; and
(Purks, especially: Fig.3, Item 300 and col.3, lines 12-25)

displaying, if a questionable wiring line which has a bad influence on the noticed wiring line is found by the noise analysis , a wiring line pattern including the noticed wiring line and the questionable wiring line on a display section;
(Purks, especially: col.2, lines 25-59)

However, Purks does not expressly teach the display of rerouted circuit layout information.

Huang does expressly teach the display of rerouted circuit layout information:

displaying the noise composite waveform after the movement of the questionable wiring line on said display section.
(Huang, especially: Fig.2, Items 204, 206, 208, 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang,

because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

21. In regards to Claim 10, Purks teaches the following limitations:

10. The noise checking method as set forth in claim 1, characterized in that it further comprises the steps of:

performing a noise analysis with regard to the noise composite waveform;
(Purks, especially: Fig.4, Items 400, 410, 414 and 416)

Purks teaches the display of routing information (see Fig.4, Items 400, 410, and 414) in the limitations below. However, Purks does not expressly teach the display of rerouted circuit layout information.

Huang does expressly teach the display of rerouted circuit layout information:

displaying, if a noise waveform which has a bad influence on the noticed wiring line is found by the noise analysis, the noise waveform on a display section; and
(Huang, especially: Fig.2, Items 210 and 212; and col.5, lines 50-62)

calculating, if the noise waveform displayed on said display section is moved on said display section by means of a pointing device, a timing changing amount of the noise waveform corresponding to an amount of the movement by said pointing device and dynamically changing a generation timing of the noise waveform by the timing changing amount.
(Huang, especially: Fig.2, Items 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

22. In regards to Claim 11, Purks does not expressly teach the display of circuit-related noise data that has been dynamically changed due to re-routing.

Huang, on the other hand, does teach the following limitations:

11. The noise checking method as set forth in claim 10, characterized in that the synthesis of the noise composite waveform and the noise checking are performed again using the noise waveform whose generation timing has been dynamically changed, and the noise composite waveform after the timing changing of the noise waveform is displayed on said display section.

(Huang, especially: Fig.2, Items 204, 206, 208, 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

23. In regards to Claim 12, Purks does not expressly teach the calculation of pin resistance, and its effect on signal integrity. Huang, on the other hand, does teach the following limitations:

12. The noise checking method as set forth in claim 1, characterized in that it further comprises the steps of:

calculating, where ringing is superposed on the noise composite waveform, a damping resistance value with which the ringing can be eliminated if the damping resistor is added to the noticed wiring line;

displaying candidate part data corresponding to the damping resistance value on said display section;

performing, in a state wherein a part selected from among the candidate part data is added to the noticed wiring line, the production of the simulation model, the simulation, the synthesis of

the noise composite waveform and the noise checking again; and

displaying the noise composite waveform after the addition of the part on said display section.

~~(Huang, especially: col.9, line 23 - col.11, line 6)~~

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

24. In regards to Claim 13, Purks does not expressly teach the distributions of the minimum and maximum values of time axis waveforms. Carlson does teach the following limitations:

13. The noise checking method as set forth in claim 1, characterized in that, in order to obtain the noise composite waveform,

(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

time axis direction distributions of a maximum value and a minimum value of the signal waveform with a delay variation taken into consideration are calculated

(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

and time axis direction distributions of a maximum value and a minimum value of a noise waveform with a noise generation timing variation taken into consideration are calculated for each kind of noise, and

(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

time axis direction distributions of the maximum value and the minimum value obtained by synthesizing the time axis direction distributions of the maximum value and the minimum value of the signal waveform and the time axis direction distributions of the maximum value and the minimum value of the noise waveforms are used as the noise composite waveform.

(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

25. In regards to Claim 14, Purks does not expressly teach checking if the minimum and maximum values of time axis waveforms satisfy the expected values for a check object pin.

Huang, on the other hand, does teach the calculation of resistance pin values, and determining circuit elements and delays, as claimed in the following limitations:

14. The noise checking method as set forth in claim 13, characterized in that, when the noise checking is performed, it is discriminated whether or not both of the time axis direction distributions of the maximum value and the minimum value of the noise composite waveform satisfy logical expected values for a check object pin.

(Huang, especially: col.9 line 23 to col.11, line 6; and Fig.2, Items 224, 226, 208, 212)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

26. In regards to Claim 19, Purks teaches the following limitations:

19. A noise checking apparatus used upon circuit designing for checking noise which has an influence on a signal waveform which propagates in a noticed wiring line on a design object circuit, ~~characterized in that it comprises~~ comprising:
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

a model production section (3) for producing a simulation model of a circuit portion relating to the noticed wiring line;
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

However, Purks only expressly teaches cross-talk noise, and not other types of noise as claimed in the following limitations.

Carlson, on the other hand, does expressly teach the use of switching noise as well as cross-talk noise.

a simulation section (4) for performing a simulation using the simulation model produced by said model production section (3) to calculate a signal waveform which propagates in the noticed wiring line and calculate a noise waveform superposed on the signal waveform in the noticed wiring line for ~~each kind~~ a plurality of kinds of noise;
(Carlson, especially: col.3, lines 1-40; and col.4, lines 18-40)

a noise waveform synthesis section (5) for synthesizing the signal waveform and the noise waveforms calculated by said simulation section (4) with generation timings of the noise waveforms taken into consideration to obtain a noise composite waveform which is the signal waveform on which the noise is superposed; and
(Carlson, especially: col.3, line 52 to col.5, line 34;)

a noise checking section (6) for performing noise checking based on the noise composite waveform obtained by said noise waveform synthesis section (5).
(Carlson, especially: Eq.1 in col.4; col.4, lines 18-40)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

27. In regards to Claim 20, Purks teaches the following limitations:

20. The noise checking apparatus as set forth in claim 19, characterized in that, where an adjacent wiring line to the noticed wiring line is turned back in such a manner as to have a plurality of proximate portions which can electrically interfere with the noticed wiring line,
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

said model production section (3) produces simulation models with regard to the individual proximate portions of the adjacent wiring line and the noticed wiring line and said simulation section (4) calculates the noise waveforms using the simulation models,
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

and then said noise waveform synthesis section (5) synthesizes the noise waveforms calculated with regard to all of the proximate portions and the signal waveforrn with generation timings of the noise waveforms taken into consideration.
(Purks, especially: col.2, "Summary of the Invention"; col.3, lines 13-49; Fig.4, Items 400-414))

28. In regards to Claim 21, Purks does not expressly teach the following limitations.

However, Carlson does expressly teach the following limitations:

21. The noise checking apparatus as set forth in claim 19, characterized in that said noise checking section (6)

(Carlson, especially: col.3, line 41 – col.5, line 17)

extracts a maximum delay time
and a minimum delay time of the noticed wiring line
from the noise composite waveform
(Carlson, especially: col.3, line 41 – col.5, line 17)

and performs
overdelay/racing checking for the noticed wiring
line using the maximum delay time and the minimum
delay time.
(Carlson, especially: col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

29. In regards to Claim 22, Purks does not expressly teach the following limitations. However, Carlson does expressly teach the following limitations:

22. The noise checking apparatus as set forth
in claim 19, characterized in that, where the signal
waveform which propagates in the noticed wiring
line is a clock waveform,
(Carlson, especially: col.3, line 41 – col.5, line 17)

said noise checking
section (6) calculates a pulse period of the noise
composite waveform from crossing points of the
noise composite waveform and a high level
discrimination threshold value/low level
discrimination threshold value for the signal
waveform
(Carlson, especially: Fig.4, Fig.5 and col.4, line 18 – col.4, line 40)

and performs pulse period checking of the
clock waveform in the noticed wiring line based on
the pulse period.
(Carlson, especially: Fig.5 and col.5, lines 35-57)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

30. In regards to Claim 23, Purks does not expressly teach the following limitations. However, Carlson does expressly teach the following limitations:

23. The noise checking apparatus as set forth in claim 1, characterized in that, where the signal waveform which propagates in the noticed wiring line is a clock waveform, said noisechecking section (6) calculates a rising width and a falling width of the noise composite waveform from crossing points of the noise composite waveform and a high level discrimination threshold value/low level discrimination threshold value for the signal waveform and performs pulse width checking of the clock waveform in the noticed wiring line based on the rising width and the falling width.

(Carlson, especially: Fig.4, Fig.5 and col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

31. In regards to Claim 24, Purks does not expressly teach the following limitations. However, Carlson does expressly teach the following limitations:

24. The noise checking apparatus as set forth in claim 1, characterized in that, where the signal waveform which propagates in the noticed wiring line is a clock waveform, said noise checking section (6) calculates a time required for the noise composite waveform to rise and another time required for the noise composite waveform to fall from crossing points of the noise composite waveform and a high level discrimination threshold value/low level discrimination threshold value for the signal waveform and performs checking of the rising time/falling time of the clock waveform in the noticed wiring line based on the times.
(Carlson, especially: Fig.4, Fig.5 and col.3, line 41 – col.5, line 17)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

32. In regards to Claim 25, Purks expressly teaches the use of UNIX-based stations on a network (see Purks, especially: Fig.3, Item 304; col.3, lines 36-41;). Official Notice is given that is well known in the art that the multi-threading and multi-tasking functions of UNIX operating system enable the creation of software applications that can take advantage of the parallel processing capabilities of multi-processor machines such as Sun Microsystems™ workstations.

However, Purks does not expressly teach the following limitations:

25. The noise checking apparatus as set forth in claim 19, characterized in that said simulation section (4) includes:

a file dividing section for dividing the simulation model into a plurality of files;

a parallel processor having a plurality of processing sections for executing simulations with regard to the plurality of files obtained by the division of said file dividing section parallelly; and

a file combining section for combining simulation result files by said plurality of processing sections.

Rhodes does expressly teach the dividing of a simulation model into a plurality of files and running the files parallely on a parallel processor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with the teachings of Rhodes because "Typical MPC's [Massively Parallel Computers] allow for tens to several hundred or even thousands of nodes, and thus in principle offer the ability to apply a large amount of computational power and memory to a problem." (Rhodes, p.587, col.1, lines 4-7)

33. In regards to Claim 26, Purks expressly teaches the use of UNIX-based stations on a network (see Purks, especially: Fig.3, Item 304; col.3, lines 36-41;). Official Notice is given that is well known in the art that the multi-threading and multi-tasking functions of UNIX operating system enable the creation of software applications that can take advantage of the parallel processing capabilities of multi-processor machines such as Sun Microsystems™ workstations.

However, Purks does not expressly teach the following limitations:

26. The noise checking apparatus as set forth in claim 19, characterized in that said simulation section (4) includes:

a file dividing section for dividing the simulation model into a plurality of files;

> a network interconnecting a plurality of processing sections for executing simulations with regard to the plurality of files parallelly; and
>
> a file combining section for combining simulation result files by said plurality of processing sections.

Rhodes does expressly teach the dividing of a simulation model into a plurality of files and running the files parallely on a parallel processor. Moreover, Rhodes expressly teaches an implementation called "message passing" (p.588 and Fig.1(b) and Fig.1(c)), where processing nodes communicate with one another. This communication must inherently be on some sort of network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with the teachings of Rhodes because "Typical MPC's [Massively Parallel Computers] allow for tens to several hundred or even thousands of nodes, and thus in principle offer the ability to apply a large amount of computational power and memory to a problem." (Rhodes, p.587, col.1, lines 4-7)

34. In regards to Claim 27, Purks teaches the display of routing information.

> 27. The noise checking apparatus as set forth in claim 19, characterized in that it further comprises:
>
> a noise composite waveform analysis section for performing a noise analysis with regard to the noise composite waveform;

(Purks, especially: Fig.4, Items 400, 410, 414 and 416)

Also, Purks teaches the use of a user interface, and more specifically, "a keyboard and/or mouse", both of which can be used to move a cursor ("pointing device") on the screen.

a pointing device for moving the questionable wiring line displayed on said display section on said display section; and
(Purks, especially: Fig.3, Item 300 and col.3, lines 12-25)

a movement amount calculation section for calculating an actual movement amount of the questionable wiring line corresponding to an amount of the movement by said pointing device; and that,
(Purks, especially: Fig.3, Item 300 and col.3, lines 12-25)

a display section for displaying, if a questionable wiring line which has a bad influence on the noticed wiring line is found by said noise composite waveform analysis section, a wiring line pattern including the noticed wiring line and the questionable wiring line;
(Purks, especially: col.2, lines 25-59)

However, Purks does not expressly teach the display of rerouted circuit layout information.

Huang does expressly teach the display of rerouted circuit layout information:

in the state wherein the questionable wiring line is moved by the actual movement amount, said model production section (3), said simulation section (4), said noise waveform synthesis section (5) and said noise checking section (6) are operated again and the noise composite waveform after the movement of the questionable wiring line is displayed on said display section.
(Huang, especially: Fig.2, Items 204, 206, 208, 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

35. In regards to Claim 28, Purks teaches the following limitations:

28. The noise checking apparatus as set forth in claim 19, characterized in that it further comprises:

a noise composite waveform analysis section for performing a noise analysis with regard to the noise composite waveform;
(Purks, especially: Fig.4, Items 400, 410, 414 and 416)

Purks teaches the display of routing information (see Fig.4, Items 400, 410, and 414) in the limitations below. However, Purks does not expressly teach the display of rerouted circuit layout information.

Huang does expressly teach the display of rerouted circuit layout information:

a display section for displaying, if a noise waveform which has a bad influence on the noticed wiring line is found by said noise composite waveform analysis section, the noise waveform; and
(Huang, especially: Fig.2, Items 210 and 212; and col.5, lines 50-62)

a timing changing amount calculation section for calculating a timing changing amount of the noise waveform corresponding to an amount of the movement by said pointing device and dynamically changing a generation timing of the noise waveform by the timing changing amount.
(Huang, especially: Fig.2, Items 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

36. In regards to Claim 29, Purks does not expressly teach the display of circuit-related noise data that has been dynamically changed due to re-routing.

Huang, on the other hand, does teach the following limitations:

29. The noise checking apparatus as set forth

in claim 28, characterized in that said noise waveform synthesis section (5) and said noise checking section (6) are operated again in a state wherein the generation timing of the noise waveform is changed, and the noise composite waveform after the timing changing of the noise waveform is displayed on said display section.

(Huang, especially: Fig.2, Items 204, 206, 208, 210 and 212; and col.5, lines 50-62)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

37. In regards to Claim 30, Purks does not expressly teach the calculation of pin resistance, and its effect on signal integrity. Huang, on the other hand, does teach the following limitations:

30. The noise checking apparatus as set forth in claim 19, characterized in that it further comprises:

a damping resistance value calculation section for calculating, where ringing is superposed on the noise composite waveform, a damping resistance value with which the ringing can be eliminated if the damping resistor is added to the noticed wiring line;

a part searching section for searching for candidate part data corresponding to the damping resistance value calculated by said damping resistance value calculation section;

a displaying section for displaying the candidate part data searched out by said part searching section; and

a selective inputting section for selecting apart from among the candidate part data displayed on said display section; and that,

in a state wherein the part selected from among the candidate part data is added to the noticed

wiring line, said model production section (3), said simulation section (4), said noise waveform synthesis section (5) and said noise checking section (6) are operated again, and the noise composite waveform after the addition of the part is displayed on said display section.
(Huang, especially: col.9, line 23 - col.11, line 6)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

38. In regards to Claim 31, Purks does not expressly teach the distributions of the minimum and maximum values of time axis waveforms. Carlson does teach the following limitations:

31. The noise checking apparatus as set forth in claim 19, characterized in that said noise waveform synthesis section (5)
(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

calculates time axis direction distributions of a maximum value and a minimum value of the signal waveform with a delay variation taken into consideration
(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

and calculates time axis direction distributions of a maximum value and a minimum value of a noise waveform with a noise generation timing variation taken into consideration for each kind of noise, and
(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

synthesizes the time axis direction distributions of the maximum value and the minimum value of the signal waveform and the time axis direction distributions of the maximum value and the minimum value of the noise waveforms to obtain time axis direction distributions of the maximum value and the minimum value as the noise composite waveform.
(Carlson, especially Fig.3-4, Items 300 and 400, and associated text)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Purks with those of Carlson, because in order "to more efficiently identify the signals that cause the timing problems, it is useful to perform timing filtering, logic filtering, cross-talk attacker filtering, and safety window filtering on the electronic circuits" (Carlson: col.3, lines 3-8).

39. In regards to Claim 32, Purks does not expressly teach checking if the minimum and maximum values of time axis waveforms satisfy the expected values for a check object pin.

Huang, on the other hand, does teach the calculation of resistance pin values, and determining circuit elements and delays, as claimed in the following limitations:

32. The noise checking apparatus as set forth
in claim 31, characterized in that said noise
checking section (6) discriminates whether or not
both of the time axis direction distributions of
the maximum value and the minimum value of the noise
composite waveform satisfy logical expected values
for a check object pin to perform the noise checking.
(Huang, especially: col.9 line 23 to col.11, line 6; and Fig.2, Items 224, 226, 208, 212)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Purks with those of Huang, because while Purks would identify the design problem, Huang's re-routing of the circuit would automatically solve the design problem.

Response to Arguments

Claim Rejections - 35 USC § 112

40. Applicants amended (in paper #7) "each kind of noise" to "a plurality of kinds of noise" in independent claims 1 and 19 in order to overcome the 112 first paragraph scope of enablement rejection. Moreover, (in paper #7, p.19) Applicants cite MPEP 2164.04 and request that explanations in compliance with MPEP 2164.04 be provided should the Examiner continue to maintain this rejection.

41. Applicants are referred to MPEP 2164.08 for a detailed discussion of scope of enablement rejections. More specifically, the section teaches that:

> "The determination of the propriety of a rejection based upon the scope of a claim relative to the scope of the enablement involves two stages of inquiry. The first is to determine how broad the claim is with respect to the disclosure. The entire claim must be considered. The second inquiry is to determine if one skilled in the art is enabled to make and use the entire scope of the claimed invention without undue experimentation."

42. In regards to the specifics of the rejection of the rejection in the instant application, the amended claims now read "a plurality of kinds of noise", and not "each kind of noise".

43. Examiner finds that due to the amendment, the claims are no longer broader than the disclosure. Examiner finds that "a plurality of kinds of noise" is enabled in Figs.37A-37D. Therefore, Examiner is withdrawing the 112 first paragraph rejections.

44. Examiner has also found that the amendment remedies the 112 second paragraph rejections based on lack of antecedent basis. Examiner has withdrawn these rejections as well.

Claim Rejections - 35 USC § 103

45. In regards to independent claims 1 and 19, Applicants argue (paper #7, p.21) that "In neither Purks nor Carlson is there any disclosure or teaching of any synthesizing."

46. Applicants also argue (paper #7, p.22) that "In neither Purks nor Carlson is there any disclosure of any synthesizing or noise checking section."

47. Applicants also argue (paper #7, p.22) that "In the outstanding Office action, columns 3-5 [of Carlson] have been extensively cited. There is some discussion on simulations. However, there are no discussion[s] on synthesizing as well as noise checking."

48. Applicants argue (paper #7, p.24) that all dependent claims inherit these defects.

49. Examiner respectfully disagrees. Examiner finds that both Carlson and Purks teach synthesizing and noise checking.

50. Examiner notes that the word "synthesize" is defined as "to combine by synthesis; to unite", according to the Webster's Unabridged Dictionary, 1998.

51. Examiner also notes that "cross-talk" is defined as "the presence of an unwanted signal via an accidental coupling", according to WordNet ® 1.6, © 1997 Princeton University. Examiner finds that cross-talk is inherently a form of signal synthesis.

52. Examiner also notes that "filter" is defined as "removes something from whatever passes through it", according to WordNet ® 1.6, © 1997 Princeton University. Examiner also notes that "noise filters" inherently check for and remove noise.

53. In regards to the Carlson reference, Carlson teaches "pre-filtering on victim signals" (see col.4 and Fig.1, item 115), which Examiner finds to be functionally equivalent to noise checking. Carlson also specifically teaches the elimination of voltage spike signals (col.4, lines 34-40).

54. Examiner finds this to be sufficient evidence that Carlson teaches noise checking.

55. Carlson also teaches a "static timing device" emulating a form of cross-talk referred to as "speed-up dynamic delay variation" (see Carlson, col.4, line 61 to col.5, line 34; and Fig.1, Item 125):

> "A speed-up dynamic delay variation generally occurs when an attacker signal switches in the same direction as that of the victim signal. For example, both the attacker and victim signals switch from low-to-high at about the same time. The switching of the attacker signal causes a signal-level pulling effect upon the victim signal in the direction of the attacker signal's transition. Since the driver of the victim signal is driving it in the same direction as that of the signal-level pull caused by the attacker signal, the transition of the victim signal occurs too fast, thereby causing a speed-up dynamic delay variation.
>
> One way to emulate this is by using the static timing device 200. When the static timing device 200 indicates that the victim signal has completed its transition before the minimum delay period, a speed-up dynamic delay variation has occurred, as specified at block 125. A speed-up dynamic delay variation is shown in Fig.4, where the victim signal switches to a new voltage level before the minimum delay timeline 400 minus the hold time margin 410."
>
> At block 120 of Fig.1, a determination is made regarding which sets of attacker signals are suspected of cross-talking with a victim signal ... The attacker signals that are found to not switch at the same time as the victim signal ... can be eliminated."

Carlson therefore teaches that the signal with cross-talk is a result of synthesis of the victim and attacker signals. It also teaches a "reverse engineering approach" to finding the attacker signal based on the noisy victim signal (which has cross-talk noise added to it). While this does not expressly teach separately generating a noise signal and then injecting into a victim signal, it does imply that this would

be possible. Purks, on the other hand, expressly teaches separately generating a noise signal and then injecting it into a victim signal.

56. In regards to the Purks reference, Purks teaches (col.6, lines 15-20) that "The forgoing is a complete description of the present invention which offers a cross-talk analysis system that is capable of generating real-world estimates of cross-talk noise based on forward-annotated inter-signal timing information." Further details regarding the method for generating ("synthesizing") the estimates of crosstalk-noise can be found throughout the Purks reference (especially at (col.3, lines 40-50; col.4, lines 40-52; col. 5, lines 22-32; col.5, lines 50-55; col.6, lines 15-20). Examiner finds this to be sufficient evidence that Purks teaches synthesizing.

57. Examiner is therefore maintaining the rejections.

Conclusion

58. Applicant's arguments filed 7/30/03 have been fully considered but they are not persuasive.

59. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory

period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (703) 306-0297. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on (703) 305-9704. Any response to this office action should be mailed to:

Director of Patents and Trademarks
Washington, DC 20231

Hand-delivered responses should be brought to the following office:

4th floor receptionist's office
Crystal Park 2
2121 Crystal Drive
Arlington, VA

The fax phone numbers for the organization where this application or proceeding is assigned are:

All communications:	(703) 872-9306

Or, alternatively:

Official communications:	(703) 746-7239
Non-Official / Draft communications	(703) 746-7240
After Final communications	(703) 746-7238

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist, whose telephone number is: (703) 305-3900.

Ayal I. Sharon

Art Unit 2123

September 29, 2003

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER